

6 o'clock at night. And he went on like that till now. There is no fact in all his school books that he has not heard a thousand times. He has had Goethe's maxims so drilled into him that he is "thorough" in every detail. I can imagine one Englishman in a hundred, after such a training, patiently turning over the muck heap of his knowledge; his eye would not gleam with any enthusiasm, but rather would glaze with envy and jealousy at the undeserved success of quite ignorant persons. And yet he would have knowledge, and know in his way how to use it; and it is because Germany has so many thousands of men trained in this way that she is certainly beating us to-day. They may be rather heavily loaded with learning, and I know that decently taught Englishmen who spent less than half the time at studies twenty times more interesting would beat them hollow in manufacture or research, would be the reverse of dull, and would be good citizens; yet the Englishmen I want only exist as yet by ones and twos, and such Germans are numerous. But just think of it! Here we are, a hard-headed, obstinate, cool race of men, who have had no end of chances in our safe little island, whilst our enemies were fighting among themselves, with coal and iron and the influx of good foreigners to set us first in the new field, and we have more than half of all the wealth of the world, and all that is needed for our keeping our good things is that we should believe them to be possibly evanescent; that there really is a chance that some better equipped nation may take them away from us, and therefore that we ought to prepare ourselves to fight for them. We have many chances in our favour and we hardly use them; the competing foreigner is very energetic, and cultivates his smallest chances.

JOHN PERRY.

HUMAN BABIES: WHAT THEY TEACH.

AN investigator anxious to obtain information as to the relationship of a particular species puts the question "What characters do the young stages exhibit?" and in order to answer that question he makes a study of the developmental phases exhibited by those stages. He may argue that if he finds certain characters in the young stages indicative of, and adapted to, habits of life which the adults do not possess, then there must have been a time in the ancestry of the species when such habits of life were of particular value, otherwise they would never have been developed. Or he may simply give, as the reason for his method of research, the concise statement "ontogeny repeats phylogeny," or he may hold to the theory of acceleration of development—which is more than a theory, because it is an actual fact of palæontology—that the characters of adult ancestors tend to become the characters of youthful descendants, thus producing specific diversity, without the necessity for a theory of natural, or any other form of selection, merely by inequality in the rates of developmental acceleration in different stocks. Wherefore *vice versa* the characters of youth must at one time have been adult characters; and their differences from those of the adult indicate the degree of different environment under which the adult ancestors lived.

The manner of expressing the reason for a method of research may vary; the method itself remains the same. To know the past history of an organism, study the young. That is a method of universal application. It is the guiding principle of all researches into the past history of organic beings. It becomes then equally applicable to man himself; and in that way the human baby becomes an object of scientific attention. To study the human baby in this manner, the aid of photography is important; it gives a permanent record of what would otherwise be forgotten.

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The early attempts of a baby in the matter of progression are particularly instructive. The bipedal gait is not attainable, indicating that the bipedal ability of the human being is of quite recent acquirement. What the child does show is either a truly quadrupedal method of progression, as in Fig. 1, which is also said to be common among children of uncivilised parents, or a kind of falsified quadrupedal progression on the hands and knees, which obtains generally among children of civilised parents, owing no doubt to impediments of clothes, and to over-coddling. Both methods of progression point to the same conclusion, though, of course, the former is the better illustration—that the ancestors of man were animals accustomed to a quadrupedal gait.

The influence of this quadrupedal gait of the ancestors is very strong. The child really has to unlearn it, and to readapt its hind limbs before it can attain the bipedal method of progression. The necessity for such readaptation, and the difficulty of acquiring the balance which progression on hind limbs demands, make the child's early efforts at walking so difficult. Observe a child just able to balance itself momentarily on its hind limbs. The insecurity of the position is shown by the attitude of the arms—outspread to help the balance, and by the feet being planted widely apart. The imperfection of the hind limbs for a bipedal gait is particularly noticeable.



FIG. 1.—Child ten months old, on garden path.

The legs are not straight, but they are considerably bent at the knee. That bending is incorrect for a bipedal gait; but it is a necessity of a quadrupedal progression, and it is just the feature seen when a four-footed animal, such as a cat, is induced to stand on its hind legs. In learning to walk on its hind legs the baby has to make many alterations in the anatomy of its hind limbs to fit them for their new function; and the human ancestors, in order to pass from quadrupeds to bipeds, must have had to do the same.

There is another feature noticeable in regard to such a child in its first attempts at walking—the semi-clasped position of the hands. That is natural, it may be said. Certainly it is, but nevertheless a natural feature requires an explanation, and may be of particular significance. Such is the case here; the semi-clasped position of the hands is naturally and instinctively assumed because the human ancestors had for so many generations been bough-grasping animals, quadrupeds who lived among trees, who particularly used their hands for grasping boughs. Had they used the hands in a manner which always produced extension, then the extended position of the fingers would have become habitual.

Further evidence of the particular character which generations of bough-grasping ancestors have given to the hands of children may be obtained in this way—Get

a series of school-children and ask them to hold their hands out straight. The failure of the majority of them to put out the fingers without some indication of the bough-grasping curvature will be very interesting. In some cases, especially among the younger children, the inward curve of the fingers will be very noticeable; and their inability to fully extend the fingers will be marked. A record of this inward curvature of the fingers may be obtained by photographing the extended hands when held against a dark background.

Even better evidence of the inherited bough-grasping instinct is afforded in Fig. 2. The child, about twelve months old, has picked up a flower-pot, and it has done so by dabbing the hand down upon it in the manner in which a monkey would catch at a branch. It has not made use of the thumb as an adult would do; but it has caught the rim of the flower-pot between the fingers and the palm of the hand, and in that manner has raised it up to its mouth. The sympathetic grasping attitude of the other hand may not be without significance; for although an arboreal animal like a monkey can sustain its weight by one hand, yet there would generally be a tendency to grasp with both hands at the same time in order to relieve the one arm of all the weight.



FIG. 2.—Child grasping a flower-pot.

A sympathetic action of this kind is very noticeable among children in regard to the use of the legs, and similarly it may be referred to the habits of arboreal ancestors. If a young child be put to hang on to a rope, which it will do very well long before it can support its weight in the ordinary human manner on its hind legs, or if it be merely lifted up by the hands, it will at once show a disposition to swing up its legs as if to catch at something. And this would be very natural in an arboreal quadruped. As soon as it grasped a bough with its arms, it would swing the legs up in order to grasp with the hind hands (the feet) either another bough, or in many cases the tree-trunk.

The inherited effects of grasping tree-trunks, or limbs with the hind hands are particularly marked in a young child. There is first of all, common to most babies, more or less of the bow-legged character which such trunk grasping would produce in arboreal animals. And then if a quite young child be held up so that its feet touch the ground, it will be seen that the outer portions of the feet rest on the ground, while the soles of the feet are not in position for being put flat, but are more or less opposed to one another in the manner suitable for trunk-grasping. Often, too, when the baby is lying down, the great flexibility of the ankle joint may be noticed; and the child will be seen to do, without an effort, what it would be very difficult for an adult to accomplish—it will,

without bending the knees, bring the soles of the feet flat, opposite to one another. It is quite a common thing for a baby to turn the sole of its foot so that across the sole is in a straight line with the inside of the leg.

One habit after another, one action after another which a child performs may be seen to be quite out of keeping with what may be called human instincts, but exactly in accordance with the habits of arboreal animals. And so there is an accumulation of evidence, on the ontogeny repeating phylogeny principle, that the human ancestors were monkey-like animals, arboreal in their habits. One of the first things that the human baby does is to climb, and to climb persistently. It will climb its crib, or a footstool, or the fender, and particularly the stairs. Given a fair chance, and it will develop a perfect mania for stair-climbing and a bump of locality as regards the position of the stairs in the household geography—if such a bull may be permitted. Then it will make for the stairs on all occasions, to climb with crows of pleasure. It may experience tumbles, when it will lie and howl, not so much on account of injury as at the unexpectedness of the catastrophe. But on recovering it will at once make for the stairs again, showing how strongly the climbing instinct is developed.

And the climbing instinct lasts till later in life. Young boys, and girls too, must climb. The stairs themselves have become too small for their efforts then, but the bannisters remain, and they must climb up outside these, and hang on from various points which give any facility for arm exercise. The disposition for arm gymnastics is very marked in children who are not repressed in the unnecessary conventional manner. And it is a pity that it does not receive more systematic encouragement, because it would be beneficial for chest expansion in growing children. As matters stand now such exercise as is permitted favours leg development only, while all school work promotes contracted chests and rounded backs—at any rate with the girls. Boys are rather more fortunate. They are not troubled by an ever-rampant Mrs. Grundy preaching lessons on deportment. They retain the monkey habits of tree-climbing and bird-nesting. If any one reflects how important a prize to a hungry monkey a bird's nest of eggs must be, then he will understand how the inherited instinct can be so strongly developed among boys.

However, I am wandering somewhat from the human baby, and I will return thereto by asking consideration for what should be commonly observed in any family, a child with a pleased expression. There is one point in such expression which has not received due consideration, namely, the raising of lumps of flesh each side of the nose as an indication of pleasure. Accompanying this, though difficult to bring out in a photograph, may be seen small furrows, both in children and adults, running from the eyes somewhat obliquely towards the nose. What these characters indicate may be learnt from the male mandril, whose face, particularly in the breeding season, shows coloured fleshy prominences each side of the nose with conspicuous furrows and ridges. In the male mandril these characters have been developed, because being an unmistakable sign of sexual ardour they gave the female particular evidence of sexual feelings. Thus such characters would come to be recognised as habitually symptomatic of pleasurable feelings. Finding similar features in human beings, and particularly in children, though not developed in the same degree, we may assume that in our monkey-like ancestors facial characters similar to those of the mandril were developed, though to a less extent, and that they were symptomatic of pleasure, because connected with the period of courtship. Then they became conventionalised as pleasurable symptoms.

Darwin's idea of Antithesis with regard to the expression of emotions does not commend itself. There is not

space now to consider the subject fully ; but it may be broadly stated that methods of expressing pleasure have all arisen from habits and actions employed in self-gratification—the satisfaction of the bodily requirements—either in self-nutriments or in procreation. But they may not be the actions employed by members of the species under its present-day conditions. And in the young they would certainly not be so ; they would be the crystallised epitome, if such a term be allowed, of the habits and actions which proved successful with ancestors when they lived in a very different environment. Striking coloration of the face with ridges and scar-like markings would not now give pleasure to the sexes of the human species in their civilised condition ; but the face of the male mandril is evidence of their having done so and still doing so among monkeys, and the practice of face painting, perhaps also of tattooing among savages, is evidence of the monkey habits having been inherited by the human species, and still finding favour among its members.

In the matter of pain, the idea that the expressions which indicate it go back to ancestors living under very different conditions is excellently brought out. Expressions would be the special muscular actions performed under the stimulus of a feeling of injury—such actions as were necessary to alleviate the pain, those necessary to



FIG. 3.—A child crying.

prevent further pain, or to escape from the danger indicated by the pain, and those which were employed in revenge on the inflicter of pain, on the principle that destruction of the cause of injury would be the surest method of prevention.

Therefore, one of the first things that pain prompts an animal to do is to exhibit and prepare its weapons of offence. In the case of the human baby such weapons of offence would be those which would have been employed by the pre-human ancestors. The picture of the crying child, Fig. 3, illustrates this. The peculiar squareness of the open mouth, caused by retraction of the lips at all four corners, is on purpose to exhibit the fighting weapons, the canine teeth ; although, as a matter of fact, the canine teeth have not yet been developed. But the instinct to open the mouth so as to show canine teeth has been inherited from pre-human ancestors who habitually made use of these teeth in order to fight.

There is another feature in this picture, the tight closing of the eyes. This is to protect the eyes from injury during fighting. I photographed a cat which I pretended to strike. There was the same closing of the eyes ; and, for a similar reason, a throwing back of the ears out of harm's way ; and besides there was the paw ready to strike the assailant. I photographed another cat being teased. There was just the same opening of the mouth as in this picture of the baby, and the canine teeth, which were then disclosed, showed exactly what the cat's inten-

tions were, that they were just the same as that expressed by the throwing open the portholes, and the running out the guns which we so often used to read of in accounts of men-of-war.

The lessons which the human baby can teach as regards the past history of its race are very numerous. I have only been able to glance at some of the more important ; but they are sufficient to show that the subject is one of wide range and considerable interest.

S. S. BUCKMAN.

NOTES.

LAST Thursday a combined meeting of the Royal Society and Royal Astronomical Society took place at Burlington House, when the observers who went away for the recent eclipse communicated the results of their observations. As the reports have not yet been published, we are unable to give an account of them. We have received from Prof. Langley a preliminary account, which we hope to print next week, of the expedition which went under his direction to Wadesboro, U.S.A., to observe the eclipse. The photographs he has obtained surpass any that have ever been taken at an eclipse, and speak volumes for the employment of instruments of great focal-length.

THE new physics laboratory of Owens College, Manchester, was opened on Friday last by Lord Rayleigh. Particulars as to the ceremony and the equipment of the laboratory will appear in our issue for next week.

THE Conference on Malaria, which was to have been held under the auspices of the Liverpool School of Tropical Medicine at the end of the present month, has been postponed in order to avoid clashing with the celebration of the Centenary of the Royal College of Surgeons of England and other gatherings.

WE regret to notice the death, at Manchester, on Monday last, of Dr. Daniel John Leech, a well-known physician, and professor of *Materia Medica* and *Therapeutics* in Owens College. As chairman of the *Pharmacopœia* Committee of the Medical Council he had charge of the publishing of the last edition of the *British Pharmacopœia*, and his name had been recently mentioned as the probable president of the *British Medical Association*. Dr. Leech was in his sixty-first year.

THE death is announced of Prof. Corrado Tommasi-Crudeli, secretary of the class of mathematical, physical and natural sciences in the *Reale Accademia dei Lincei*. Tommasi commenced his career in 1859 as demonstrator of pathological anatomy at Florence, after studying with Claude Bernard, of Paris, and Duchenne. In 1862 he went to study pathology under Virchow, at Berlin ; the next year he delivered a course of lectures on pathological histology at Florence, and in 1865 he was appointed professor ordinarius of anatomy at Palermo. During an outbreak of cholera in the following year, Tommasi rendered valuable services by his study of the disease and its mode of propagation, and published a well-known memoir on the subject. In 1870, Tommasi was called to Rome, where he was first appointed head of a newly-formed department of pathological histology. Later, he carried out extensive researches on the propagation of malaria. While his researches, conducted in conjunction with Klebs, have been superseded by recent discoveries, the general conclusions to which he was led have not only been substantially confirmed, but have received their true explanation in the new doctrine of the propagation of malaria by mosquitoes.

DURING the past week the summer meeting of the Institution of Mechanical Engineers has been held in London, and proved a successful gathering, interesting not only because of the various papers read (the titles of which, excluding an additional one,